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## ABSTRACT

As part of its survey of the demand for engineers and technicians conducted in the early part of 1970, the Engineering Manpower Commission asked employers two questions. The first request was: "Please list any curriculum areas in engineering where the number of graduates seems to be badly out of balance with employment needs at current compensation rates, and indicate whether these areas should be expanded or curtailed." The second request was similar except it asked for technician curriculum areas. Nearly 150 employers in manufacturing, production, consulting, and education replied and practically all of them cited areas that, in their view, needed to be expanded. Among the most often cited areas were civil, chemical, and electrical-power. The two areas which were most often cited for curtailment were aerospace and electronic. Several employers added comments to their responses. (Author/TS)

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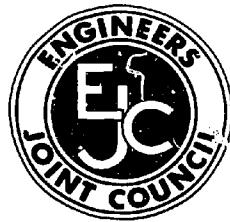
## SUPPLY-DEMAND IMBALANCES

AS SEEN BY

EMPLOYERS OF ENGINEERS AND TECHNICIANS

A REPORT BY THE

ENGINEERING MANPOWER COMMISSION  
OF  
ENGINEERS JOINT COUNCIL  
345 EAST 47TH STREET  
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SUPPLY-DEMAND IMBALANCES AS SEEN BY EMPLOYERS  
OF ENGINEERS AND TECHNICIANS

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As part of its survey of the demand for engineers and technicians conducted in the early part of 1970, the Engineering Manpower Commission asked employers to indicate any areas in which they saw an imbalance between the number of graduates from various programs and their own needs for employees. Nearly 150 employers took the trouble to write in replies to this question, and practically all of them cited areas that, in their view, needed to be expanded.

It should be noted that the employment market for engineers and technicians in early 1970 was still fairly active. Nevertheless employers in this same survey were projecting a substantial cutback in their hiring plans for 1970 and 1971, which have since been reflected in the current depressed demand for engineers as compared with recent past years. Thus the employers who set forth their ideas on the need for increased emphasis in certain curriculum areas were not, in general, influenced by unrealistically optimistic visions of expanding employment. Their views should, therefore, be of interest to educators despite today's relatively inactive employment market. In particular they seem to indicate directions in which educational effort might be shifted away from fields, such as aerospace, where employment demand is known to be weak, toward others in which jobs are more likely to be available even in times of industrial retrenchment.

In view of the overall engineering and technological employment situation existing in mid-1971, schools should not interpret the term "expansion" as used in this report as implying an unlimited expansion of any of the curriculum areas mentioned. Within a broad engineering or technology program, however, some of these areas might warrant selective expansion to offset decreasing demand for graduates in other specialties, particularly where the results of the EMC survey are supported by the school's own placement experience.

Comments relating to engineering curricula start on page 2, while those relating to technician programs start on page 13.

I. QUESTION: Please list any curriculum areas in engineering where the number of graduates seems to be badly out of balance with employment needs at current compensation rates, and indicate whether these areas should be expanded or curtailed.

| <u>Kind of Company</u>             | <u>Curriculum Area</u>  | <u>Imbalance Requiring</u>                       | <u>Comments</u>  |
|------------------------------------|---|--|--|
| Specialty chemical manufacturer    | Sales Engineering   | Expansion  |  |
| Major pharmaceuticals manufacturer | Chemical Engineering<br>Mechanical Engineering  | Expansion<br>Expansion                           |  |
| Small pharmaceuticals manufacturer | Chemical Engineering  | Expansion  | Insufficient supply                                      |
| Small pharmaceuticals manufacturer | Chemical Engineering  | Expansion  |  |
| Industrial chemical producer       | Chemical  | Expansion  |  |
| Major chemical manufacturer        | Chemical Engineering<br>Mechanical Engineering  | Expansion<br>Expansion                           |  |
| Oil company                        | Petroleum Engineering   | Expansion  |  |
| Oil company                        | Chemical Engineering<br>Petroleum Engineering<br>Electrical Engineering<br>Mechanical Engineering | Expansion<br>Expansion<br>Expansion<br>Expansion |  |
| Major oil company                  | Chemical Engineering<br>Petroleum Engineering   | Expansion<br>Expansion                           | Continue emphasis on attracting students to these fields |
| Electrical equipment manufacturer  | Electronic<br>Power   | Curtailment<br>Expansion                         | Many companies retrain<br>Not enough available           |
| Electronic equipment manufacturer  | Integrated circuits   | Expansion  | Need more classroom theory                               |
| Electronic instrument manufacturer | Graduate Electrical   | Expansion  | Require higher educational level                         |
| Electronic instrument manufacturer | Computer Science<br>Electronics   | Expansion<br>Expansion                           |  |

QUESTION I [Continued]

| <u>Kind of Company</u>                           | <u>Curriculum Area</u>  | <u>Imbalance Requiring</u>            | <u>Comments</u>                |
|--|---|---------------------------------------|--------------------------------|
| Electrical and electronic equipment manufacturer | Electrical Engineering  | Expansion                             |                                |
| Industrial controls manufacturer                 | Mechanical & related Electronics & related                                | Expansion<br>Curtailment              | A bit top heavy in electronics |
| Computer manufacturer                            | Electrical Engineering<br>Industrial Engineering                          | Expansion<br>Curtailment              |                                |
| Aluminum producer                                | Chemical Engineering<br>Mechanical Engineering                            | Expansion<br>Expansion                |                                |
| Non-ferrous metals producer                      | Mining<br>Mineral Beneficiation - Extractive Metallurgy                   | Expansion<br>Expansion                |                                |
| Specialty metals company                         | Metallurgy  | Expansion                             |                                |
| Steel company                                    | Metallurgical Engineering   | Expansion                             |                                |
| Specialty steel producer                         | Metallurgical Engineering   | Expansion                             |                                |
| Steel producer                                   | Electrical Engineering<br>Mechanical Engineering<br>Metallurgical & Chem. | Expansion<br>Expansion<br>Curtailment | As per recruiting results      |
| Metal products manufacturer                      | Consumer Product Development and Design                                   | Expansion                             | Could be non-college "degree"  |
| Auto parts manufacturer                          | Research<br>Development<br>Design   | Curtailment<br>Expansion<br>Expansion |                                |
| Machinery manufacturer                           | Mechanical-Agricultural   | Expansion                             | Shortage of this specific type |
| Foundry  | Mechanical Engineering  | Expansion                             |                                |
| Metal products manufacturer                      | Need better training in engineering materials and in actual design        | Expansion                             |                                |

QUESTION I [Continued]

| <u>Kind of Company</u>            | <u>Curriculum Area</u>                                    | <u>Imbalance Requiring</u>          | <u>Comments</u>  |
|-----------------------------------|---|-------------------------------------|--|
| Machinery manufacturer            | Civil Engineering   | Expansion                           |  |
| Large can company                 | Mechanical Engineering                                    | Expansion                           |  |
| Metal products manufacturer       | Welding Engineering                                       | Expansion                           |  |
| Lubricating products manufacturer | Plastics Engineering                                      | Expansion                           |  |
| Metal products manufacturer       | Product Design  | Expansion                           |  |
| Refractories manufacturer         | Ceramic Engineering                                       | Expansion                           |  |
| Household products manufacturer   | Industrial Engineering<br>Ceramics Engineering            | Expansion<br>Expansion              |  |
| Cement company                    | Chemical Engineering                                      | Expansion                           |  |
| Sulfur producer                   | Electrical Engineering<br>Chemical Engineering            | Curtailment<br>Expansion            |  |
| Iron mining company               | Mining Engineers  | Expansion                           |  |
| Copper producer                   | Mining Engineering<br>Metallurgy<br>Materials Engineering | Expansion<br>Expansion<br>Expansion | Acute shortage<br>Acute shortage                                 |
| Non-ferrous mining company        | Mining Engineers  | Expansion                           | Definite shortage  |
| Uranium mining company            | Mine Engineers  | Expansion                           | Present shortage is worsening each year due to lack of graduates |
| Paper company                     | Cost Engineering & Estimating                             | Expansion                           |  |
| Paper company                     | Mechanical Engineering                                    | Expansion                           |  |
| Paper machinery manufacturer      | Refrigeration   | Expansion                           |  |

QUESTION I [Continued]

| <u>Kind of Company</u>                    | <u>Curriculum Area</u>                         | <u>Imbalance Requiring</u> | <u>Comments</u>   |
|---|--|----------------------------|---|
| Machinery manufacturer                    | Mechanical Design                              | Expansion                  |   |
| Materials handling equipment manufacturer | Fluidics                                       | Expansion                  | More courses in hydraulic drives and controls                 |
| Machinery manufacturer                    | Aerospace                                      | Curtailment                | Seems that most engineers are in Aerospace. I cannot use them |
| Pump manufacturer                         | Aerospace                                      | Curtailment                | Gov't action  |
| Conveyor manufacturer                     | Elect., Electronics, & related                 | Expansion                  | Need here is for experienced industrial control people        |
| Electrical equipment manufacturer         | Electrical                                     | Expansion                  |   |
| Household equipment manufacturer          | Electrical Industrial                          | Expansion<br>Curtailment   |   |
| Auto parts manufacturer                   | Electronic Design                              | Expansion                  |   |
| Automobile manufacturer                   | Mechanical                                     | Expansion                  |   |
| Fabricated products                       | Plastics Engineers                             | Expansion                  |   |
| Metal parts fabricator                    | Industrial Engineering                         | Expansion                  | Job shop background rather than high production               |
| Machinery manufacturer                    | Agricultural Engineering                       | Curtailment                | Depressed farm economy  |
| Photographic manufacturer                 | Electrical Engineering<br>Chemical Engineering |                            | Probably oversupply is only temporary<br>Chronic shortage     |
| Electrical controls manufacturer          | Mechanical<br>Electrical                       | Expansion<br>Expansion     |   |
| Office machines manufacturer              | M.S.-All Engineers                             | Curtailment                | Overpriced  |

QUESTION I [Continued]

| <u>Kind of Company</u>            | <u>Curriculum Area</u>                         | <u>Imbalance Requiring</u> | <u>Comments</u>   |
|-----------------------------------|--|----------------------------|---|
| Machinery manufacturer            | Reliability Engineering<br>Turbine background  | Expansion<br>Expansion     |   |
| Structural design consulting firm | Civil & Architectural                          | Expansion                  | Shortage would be serious, were it not for other firms recruiting abroad and bringing foreign engineers to the area |
| Heavy construction company        | Chemical Engineers<br>Electrical Engineers     |                            | We have experienced a critical shortage of chemical and electrical engineers, but not related to compensation rates |
| Construction firm                 | Civil & Construction                           | Expansion                  |   |
| Design and construction company   | Civil (M.S. & Ph.D.)                           | Curtailment                |   |
| Construction firm                 | Heavy Construction                             | Expansion                  | Civil engineering schools seem to be abdicating construction  |
| Structural design consulting firm | M.S. Level -<br>Structural Dynamics            |                            | Need U.S. citizens; graduates   |
| Consulting engineering firm       | Engineering Practice                           | Expansion                  | Present goals of engrg. education misdirected   |
| Structural design consulting firm | Civil Engineering                              | Expansion                  |   |
| Structural design consulting firm | Civil and related                              | Expansion                  |   |
| Structural design consulting firm | Mechanical, Electrical,<br>Heating - Buildings | Expansion                  |   |
| Structural design consulting firm | Civil<br>Mechanical                            | Expansion<br>Curtailment   | Highways & Sanitation<br>Reduction war contracts  |

QUESTION I [Continued]

| <u>Kind of Company</u>              | <u>Curriculum Area</u>   | <u>Imbalance Requiring</u>                       | <u>Comments</u>                                    |
|-------------------------------------|--|--|--|
| Structural design consulting firm   | Civil Design   | Expansion  | Ports and bridges                                  |
| Structural design consulting firm   | B.S. Civil Engineering<br>M.S. Sanitary Engrg.   | Expansion<br>Expansion                           |  |
| Structural design consulting firm   | Civil Design   | Expansion  |  |
| Structural design consulting firm   | Industrial Waste Treatment<br>Electrical Engineering   | Expansion<br>Expansion                           | Very few applicants with experience                |
| Industrial & structural design firm | Mechanical - Power & HVAC<br>Electrical - Power<br>Civil - General<br>Chemical - Water & Waste Treatment | Expansion<br>Expansion<br>Expansion<br>Expansion |  |
| Structural design consulting firm   | Engineering Economics<br>(including valuation of utility properties)                                     | Expansion  | Can't find any candidates                          |
| Structural design consulting firm   | Civil<br>Mechanical<br>Electrical  | Curtailment<br>Expansion<br>Expansion            | Can't hire experienced men in these 2 branches     |
| Structural design consulting firm   | Electrical   | Expansion  | This is most critical area                         |
|                                     | Mechanical<br>Industrial   | Expansion<br>Expansion                           |  |
| Structural design consulting firm   | Mech. & Elec. Bldg. Design   | Expansion  |  |
| Structural design consulting firm   | Business<br>Law  | Expansion<br>Expansion                           |  |
| Engineering consulting firm         | Mining Engineering   | Expansion  |  |
| Engineering consulting firm         | Mechanical Engineers<br>Electrical Engineers<br>Electronic Engineers                                     | Expansion<br>Expansion<br>Curtailment            | Short in the facility field<br>Too many gadzeteers |

QUESTION I [Continued]

| <u>Kind of Company</u>      | <u>Curriculum Area</u>         | <u>Imbalance Requiring</u> | <u>Comments</u>  |
|-----------------------------|--------------------------------|----------------------------|--|
| Petroleum service company   | Electrical & related           |                            | slowing of the general economy, industry slowdown due to political & social related factors affecting offshore & Alaska operations   |
| Engineering service company |                                |                            | Engineering graduates that we interview & hire generally have excellent academic qualifications, and theoretical knowledge, but lack practical application experience. We would like to see more co-op programs for engineering students |
| Public power producer       | Power Option - EE              | Expansion                  | More faculty interest needed   |
| Electric utility            | Power Option - Mechanical      | Expansion                  |  |
| Electric utility            | Electric Power - Systems       | Expansion                  |  |
| Electric utility            | Electrical Civil               | Expansion<br>Curtailment   |  |
| Electric utility            | Electric Power                 | Expansion                  |  |
| Electric utility            | Electrical (Power)             | Expansion                  | Field has been ignored   |
| Electric utility            | Electrical Engrs. - Power Work |                            | Expansion  |
| Electric utility            | Power Engineering              | Expansion                  | Glamour of electronics & space age outdraw utility engineer  |
| Electric utility            | Electrical - Power Option      | Expansion                  |  |

QUESTION I [Continued]

| <u>Kind of Company</u>        | <u>Curriculum Area</u>   | <u>Imbalance Requiring</u>            | <u>Comments</u>  |
|-------------------------------|--|---------------------------------------|--|
| Electric utility              | Electrical - Power Option                                      | Expansion                             |  |
| Gas & electric utility        | Power Engineering  | Expansion                             | Very few schools offer power option                                  |
| Electric utility              | Power Generation and Distribution                              | Expansion                             | Very little orientation toward power industry                        |
| Electric utility              | Power Systems, EE  | Expansion                             |  |
| Electric utility              | Electrical Engineering - Power Oriented                        | Expansion                             |  |
| Electric utility              | Electrical - Power Engr.                                       | Expansion                             |  |
| Gas & electric utility        | Electrical (Utility)<br>Gas (Utility)                          | Expansion<br>Expansion                |  |
| Gas utility                   | Chemical Engineering   | Expansion                             |  |
| Gas pipeline company          | Chemical<br>Petroleum<br>Metallurgical                         | Expansion<br>Expansion<br>Expansion   |  |
| Gas producer                  | Sales Engineering  | Expansion                             |  |
| Telephone company             | Electrical   | Expansion                             |  |
| Telephone company             | Electrical Engineering   | Expansion                             | Inadequate manpower available for operation engineering applications |
| Railroad                      | Civil Engineering  | Expansion                             | More needed  |
| Trucking company              | Experienced Civil Engineers                                    | Expansion                             |  |
| Research firm                 | Materials  | Expansion                             |  |
| Communications R&D laboratory | Computer Science<br>Operations Research                        | Expansion<br>Expansion                |  |
| Engineering school            | Computer engineering<br>Aerospace<br>Environmental Engineering | Expansion<br>Curtailment<br>Expansion |  |

QUESTION I [Continued]

| <u>Kind of Company</u> | <u>Curriculum Area</u>  | <u>Imbalance Requiring</u>            | <u>Comments</u>  |
|------------------------|---|---------------------------------------|--|
| Engineering school     | Industrial Engineering  | Expansion                             |  |
| Engineering school     | Welding Engineering   | Expansion                             | Is not attractive to new students but demands are tremendous |
| Engineering school     | Aerospace<br>Oceanography<br>Environmental Engineering              | Curtailment<br>Expansion<br>Expansion |  |
| Engineering school     | Industrial Engineering  | Expansion                             |  |
| Engineering school     | Computer science  | Expansion                             | Ph.D.'s in short supply                                      |
| Engineering school     | Mechanical engineering  |                                       | Supply most plentiful-<br>may not be surplus,<br>however     |
| Engineering school     | Ceramic Engineering   | Expansion                             |  |
| Engineering school     | Manufacturing   | Expansion                             |  |
| Armed forces academy   | Engineering Materials<br>Ocean Engineering<br>Computer Science      | Expansion<br>Expansion<br>Expansion   |  |
| Engineering school     | Transportation Specialist   | Expansion                             |  |
| Engineering school     | Mechanical Design, Ph.D.  | Expansion                             |  |
| Engineering school     | Management Engineering  | Expansion                             |  |
| Engineering school     | Social Systems<br>Transportation<br>Applied Mechanics               | Expansion<br>Expansion<br>Curtailment | Too many Ph.D.'s   |
| Engineering school     | Chemical & Natural Gas<br>Electrical & Electronics                  | Expansion<br>Expansion                |  |
| Engineering school     | Civil Engineering<br>Chemical Engineering<br>Electrical Engineering | Expansion<br>Expansion<br>Expansion   |  |
| Engineering school     | Agricultural Engineering  | Expansion                             |  |
| Engineering school     | Naval Architecture  | Expansion                             |  |

QUESTION I [Continued]

| <u>Kind of Company</u>          | <u>Curriculum Area</u>  | <u>Imbalance Requiring</u>          | <u>Comments</u>                      |
|---------------------------------|---|-------------------------------------|--------------------------------------|
| Federal agency                  | Electrical<br>Environmental<br>Mechanical   | Expansion<br>Expansion<br>Expansion |                                      |
| State highway department        | Civil Engineering   | Expansion                           |                                      |
| State transportation department | Environmental Engineering:<br>(Urban & Regional Systems<br>Design)<br>Civil Engineering | Expansion<br>Expansion              |                                      |
| State public works department   | Civil Engineering   | Expansion                           | Starting pay is too low              |
| State highway department        | Civil Engineering   | Expansion                           |                                      |
| State highway department        | Civil Engineering   | Expansion                           |                                      |
| City water department           | Civil and Related   | Expansion                           |                                      |
| City transportation department  | Traffic Engineers   | Expansion                           | Need more                            |
| County park department          | Civil and related   | Expansion                           | Salary schedules<br>need improvement |
| City public works department    | Civil   | Expansion                           |                                      |
| City public service department  | EE  | Expansion                           | Large demand for EE<br>graduates     |

II. QUESTION: Please list any technician curriculum areas where the number of graduates seems to be badly out of balance with employment needs, and indicate whether these areas should be expanded or curtailed.

| <u>Kind of Company</u>            | <u>Curriculum Area</u>  | <u>Imbalance Requiring</u>          | <u>Comments</u>                          |
|-----------------------------------|---|-------------------------------------|--|
| Specialty chemical manufacturer   | Drafting<br>Chemical Laboratory Tech.                                       | Expansion<br>Expansion              |  |
| Specialty chemical manufacturer   | Chemical  | Expansion                           |  |
| Oil Company                       | Chemical Engineering<br>Mechanical Engineering<br>Electrical (Power) Engrg. | Expansion<br>Expansion<br>Expansion | Industry could use more in each category |
| Electronic equipment manufacturer | Solid-State Theory  | Expansion                           | Need less tube theory for our products   |
| Electronic equipment manufacturer | Electronic Test Techniques  | Expansion                           |  |
| Radio manufacturer                | E.T. & M.T. at A.S. & B.S. Level  | Expansion                           |  |
| Computer manufacturer             | Electro/Mechanical<br>Chem/Electronics                                      | Expansion<br>Expansion              |  |
| Steel company                     | Electronic Repair and Maintenance   | Expansion                           |  |
| Specialty steel producer          | Metallurgical   | Expansion                           |  |
| Steel company                     | Electrical<br>Mechanical  | Expansion<br>Expansion              |  |
| Metal products manufacturer       | Drafting/Design   | Expansion                           |  |
| Auto parts manufacturer           | Chemical<br>Drafting  | Expansion<br>Expansion              |  |
| Machinery manufacturer            | Mechanical Technicians  | Expansion                           |  |
| Foundry                           | Mechanical Technicians  | Expansion                           |  |
| Metal products manufacturer       | Drafting & Design   | Expansion                           |  |

QUESTION II [Continued]

| <u>Kind of Company</u>              | <u>Curriculum Area</u>  | <u>Imbalance Requiring</u> | <u>Comments</u>   |
|-------------------------------------|---|----------------------------|---|
| Household products manufacturer     | Quality Control Technicians<br>Ceramic Technicians                                    | Expansion<br>Expansion     |   |
| Non-ferrous mining company          | Electrical  | Expansion                  | Shortage of mine electricians   |
| Talc producer                       | Chemistry-Surveying<br>Technical assistants -<br>Technicians                          | Expansion<br>Expansion     | Not everyone can be president   |
| Paper box company                   | Design Engineers for<br>Corrugated Industry   | Expansion                  |   |
| Paper company                       | Electrical Distribution<br>and Control Draftsmen<br>and Installation Super-<br>visors | Expansion                  |   |
| Machinery manufacturer              | Mechanical Drafting<br>Structural Drafting  | Expansion<br>Expansion     |   |
| Machinery manufacturer              | Design & Related Activities   | Expansion                  |   |
| Conveyor manufacturer               | Design & Related Activities   | Expansion                  | Conveyor design and application is not taught in schools-- for that matter, Materials Handling in general is not being specialized in as far as we know |
| Household equipment manufacturer    | Electrical<br>Industrial  | Expansion<br>Curtailment   |   |
| Auto parts manufacturer             | Manufacturing Methods   | Expansion                  |   |
| Fabricated products manufacturer    | Electronic Technicians  | Expansion                  |   |
| Machinery manufacturer              | Mechanical Design<br>Technology   | Expansion                  | Lacking in our area   |
| Photographic equipment manufacturer | Chemical Technology   | Expansion                  |   |

QUESTION II [Continued]

| <u>Kind of Company</u>            | <u>Curriculum Area</u>   | <u>Imbalance Requiring</u>          | <u>Comments</u>   |
|-----------------------------------|--|-------------------------------------|---|
| Electrical controls manufacturer  | Electronic Technician<br>Mechanical Designers                            | Expansion<br>Expansion              |   |
| Office products manufacturer      | Mechanical Technicians   | Expansion                           |   |
| Aircraft engine manufacturer      | Computer Science   | Expansion                           |   |
| Machinery manufacturer            | Mechanical Technology  | Expansion                           | Need more who are interested in manufacturing (tool engineering and processing) |
| Machinery manufacturer            | Data Processing  | Curtailment                         |   |
| Heavy construction company        | Electrical<br>Chemical   | Expansion<br>Expansion              |   |
| Design and construction company   | Structural Design<br>Electrical Power                                    | Expansion<br>Expansion              | Critical need<br>Critical need  |
| Consulting engineering firm       | Math.-Physics-English  | Expansion                           | Too much stress on skills in curriculum   |
| Structural design consulting firm | Structural & Highway<br>Drafting<br>Surveying<br>Construction Inspection | Expansion<br>Expansion<br>Expansion | Extreme shortage exists in qualified personnel                                  |
| Structural design consulting firm | Design & Related Activities  | Expansion                           |   |
| Structural design consulting firm | Civil<br>Mechanical  | Expansion<br>Curtailment            | Highways & sanitation<br>Reduction war contracts                                |
| Structural design consulting firm | Civil Design   | Expansion                           |   |
| Structural design consulting firm | Land Surveyors   | Expansion                           |   |
| Structural design consulting firm | Drafting, Design and related<br>Civil Engrg. and related                 | Expansion<br>Expansion              |   |

QUESTION II [Continued]

| <u>Kind of Company</u>            | <u>Curriculum Area</u>  | <u>Imbalance Requiring</u>          | <u>Comments</u>  |
|-----------------------------------|---|-------------------------------------|--|
| Structural design consulting firm | Civil Technology & Drafting   | Expansion                           |  |
| Structural design consulting firm | Civil Engineering & related   | Expansion                           | Appears to be more of an awareness on the part of the schools of this need |
| Structural design consulting firm | Sanitary Engineering  | Expansion                           | Need for additional employees in water and air pollution fields            |
| Structural design consulting firm | Mechanical<br>Civil<br>Electrical (non-electronic)                        | Expansion<br>Expansion<br>Expansion |  |
| Structural design consulting firm | Air Conditioning<br>Piping<br>Electrical                                  | Expansion<br>Expansion<br>Expansion | Fully qualified design draftsmen not available                             |
| Structural design consulting firm | Civil Tech.-Environmental<br>Civil Tech.-Computer Usage                   | Expansion<br>Expansion              |  |
| Structural design consulting firm | Electrical<br>Mechanical<br>Industrial                                    | Expansion<br>Expansion<br>Expansion | Most critical  |
| Structural design consulting firm | Electrical (power & lighting)<br>Mechanical (air conditioning)            | Expansion<br>Expansion              |  |
| Structural design consulting firm | Mech. & Elec. Bldg. Design  | Expansion                           |  |
| Structural design consulting firm | Research & Development  | Expansion                           |  |
| Construction firm                 |   |                                     | We need skilled crafts-men--a few engineers go a long way in construction  |
| Structural design consulting firm | Mech.-Facility Designers<br>Elec.-Facility Designers<br>Drafting-Facility | Expansion<br>Expansion<br>Expansion | Supply short and quality poor  |

QUESTION II [Continued]

| <u>Kind of Company</u> | <u>Curriculum Area</u>                                      | <u>Imbalance Requiring</u>            | <u>Comments</u>  |
|------------------------|---|---------------------------------------|--|
| Electric utility       | Electrical Technology                                       | Expansion                             |  |
| Electric utility       | Electronics   | Curtailment                           |  |
| Electric utility       | 2 year Electrical Tech.                                     | Expansion                             | Too many 2 year people are trying to develop into a 4 year technologist leaving a void |
| Gas & electric utility | Gas (Utility)<br>Electric (Utility)                         | Expansion<br>Expansion                |  |
| Gas utility            | Mechanical<br>Computer, Mathematical<br>Electrical          | Expansion<br>Expansion<br>Curtailment |  |
| Railroad               | Civil Engineering -<br>Surveyor                             | Expansion                             |  |
| Research firm          | Materials   | Expansion                             |  |
| Aerospace manufacturer | Chemical Technician<br>Physical Science Tech.               | Expansion<br>Expansion                |  |
| Engineering school     | Nuclear Technicians   | Expansion                             |  |
| Engineering school     | Electronics<br>Numerical control                            | Expansion<br>Expansion                |  |
| Armed forces academy   | General specialization in<br>TV projection (closed circuit) | Expansion                             |  |
| Engineering school     | Chemical<br>Electrical<br>Mechanical                        | Expansion<br>Expansion<br>Expansion   |  |
| Engineering school     | Electrical, Electronics, etc.                               | Expansion                             |  |
| Engineering school     | Electronics<br>Mechanical                                   | Expansion<br>Expansion                |  |
| Engineering school     | EE  | Expansion                             |  |
| Engineering school     | Agricultural Engineering                                    | Expansion                             |  |

QUESTION II [Continued]

| <u>Kind of Company</u>          | <u>Curriculum Area</u>   | <u>Imbalance Requiring</u>                       | <u>Comments</u>  |
|---------------------------------|--|--|--|
| Engineering school              | Electrical Engineering<br>Textile Engineering<br>Civil Engineering<br>Chemistry and Chem. Engrg. | Expansion<br>Expansion<br>Expansion<br>Expansion |  |
| Engineering school              | 4-year Terminal Technologies   | Expansion  |  |
| Engineering school              | Electronic Technician  | Expansion  |  |
| Community college               | Mechanical Technology<br>Gas Welding<br>Electronic Welding                                       | Curtailment<br>Curtailment<br>Expansion          |  |
| State highway department        | Highway Technology   | Expansion  |  |
| State highway department        | Civil Technology   | Expansion  |  |
| State transportation department | Civil Technology   | Expansion  |  |
| State highway department        | Drafting   | Expansion  | Pay scale too low to attract individuals   |
| City water department           | Civil and related  | Expansion  |  |
| County park department          | Civil Technology   | Expansion  | Insufficient educational programs  |
| City water department           | Sanitary Engineering   | Expansion  |  |
| City water department           | Instrumentation-Automation   | Expansion  | Involving maintenance and repairs including remote supervisory electrical-electronic equipment |

## **ENGINEERS JOINT COUNCIL**

### **MEMBER SOCIETIES**

American Society of Civil Engineers  
American Institute of Mining, Metallurgical and Petroleum Engineers  
American Society of Mechanical Engineers  
American Society for Engineering Education  
Society of Naval Architects and Marine Engineers  
American Society for Testing and Materials  
American Society of Agricultural Engineers  
American Institute of Consulting Engineers  
American Society for Metals  
Society of Manufacturing Engineers  
Society for Experimental Stress Analysis  
Instrument Society of America  
American Society for Quality Control  
American Institute of Industrial Engineers  
Society of Fire Protection Engineers  
American Institute of Plant Engineers  
American Association of Cost Engineers  
Society of American Military Engineers

### **ASSOCIATE SOCIETIES**

Air Pollution Control Association  
National Institute of Ceramic Engineers  
American Society for Nondestructive Testing  
Society of Packaging and Handling Engineers  
International Material Management Society  
Society for Women Engineers  
Society for the History of Technology  
Western Society of Engineers  
Michigan Engineering Society  
Louisiana Engineering Society  
North Carolina Society of Engineers  
Washington Society of Engineers  
Engineering Societies of New England  
South Carolina Society of Engineers  
Los Angeles Council of Engineers and Scientists  
Hartford Engineers Club  
International Material Management Society (New Jersey Chapter)  
Cleveland Engineering Society